# The Spokesman

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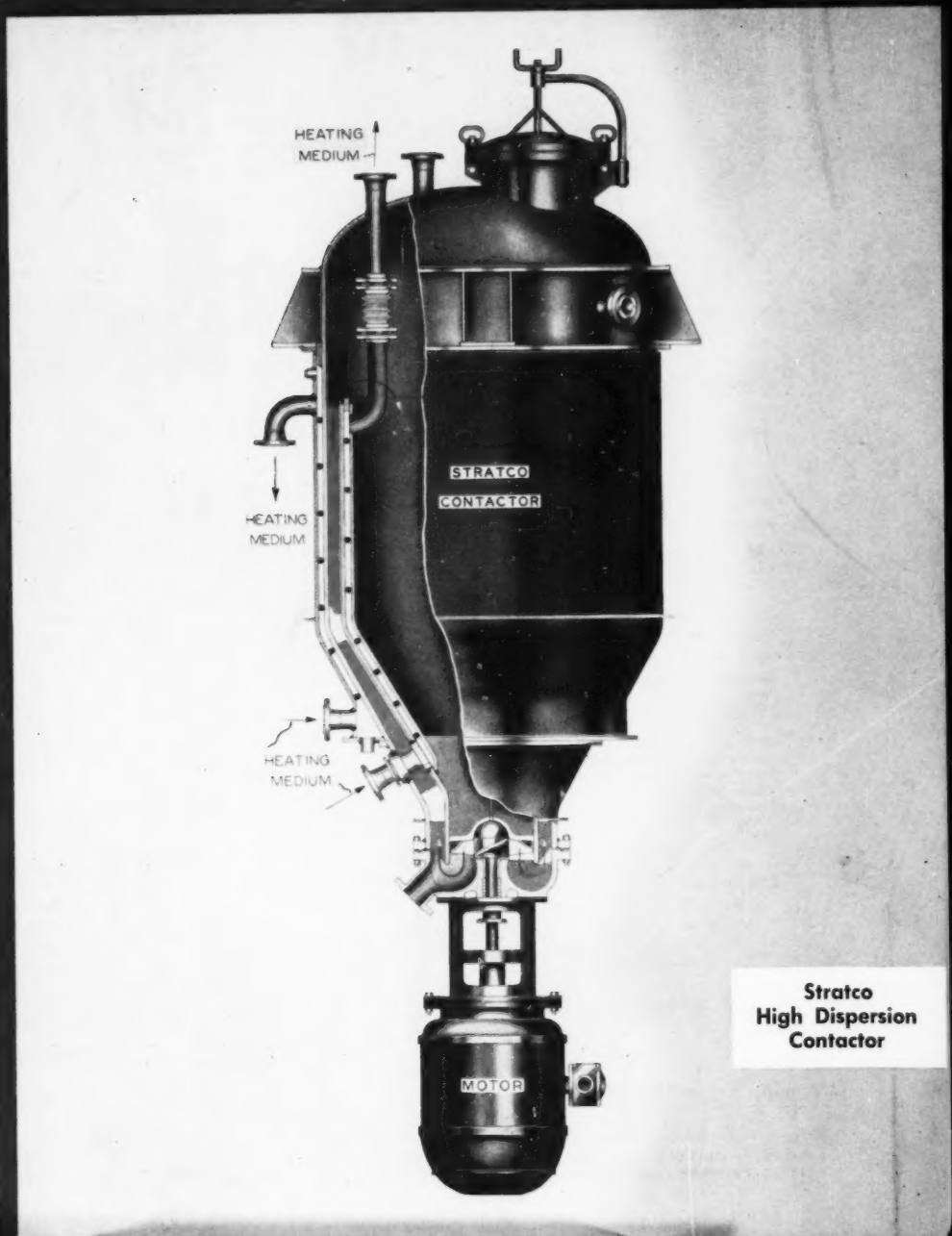


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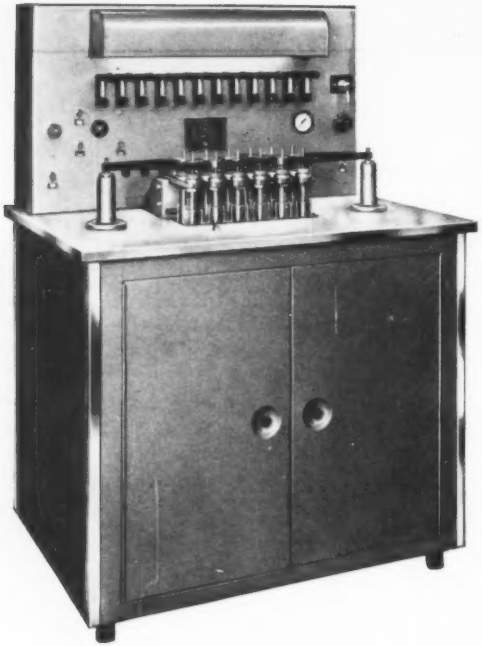

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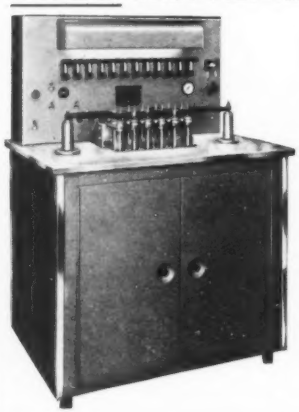

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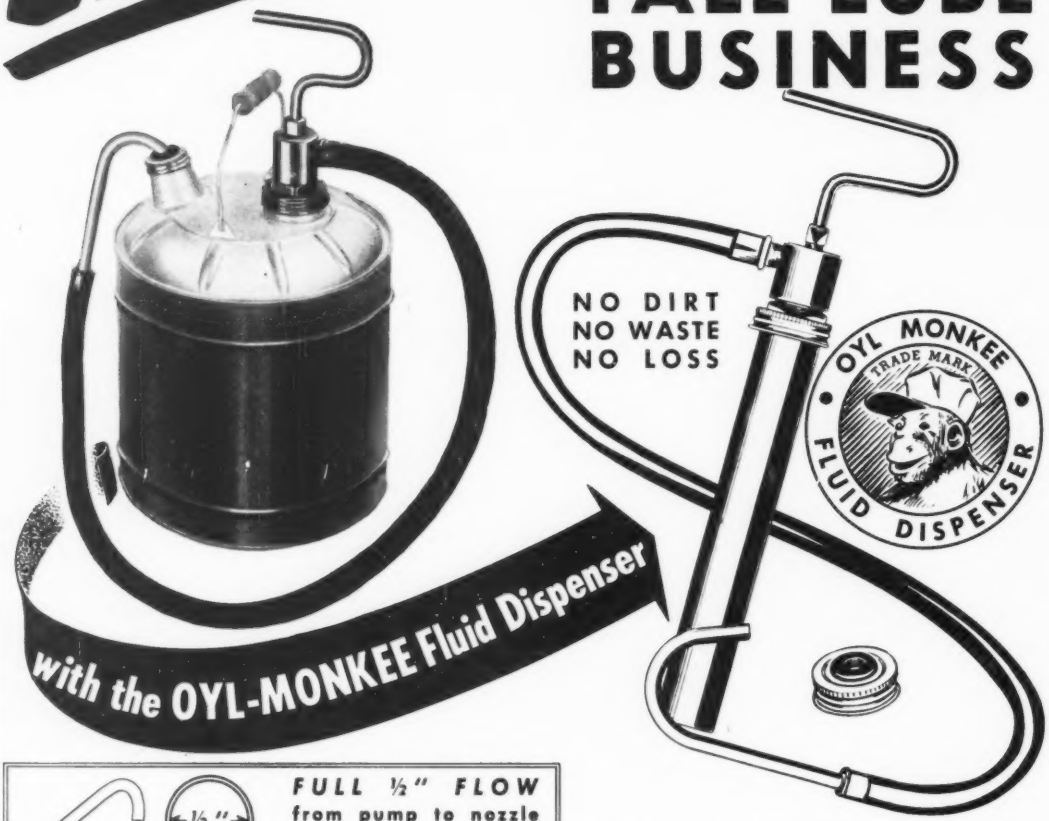


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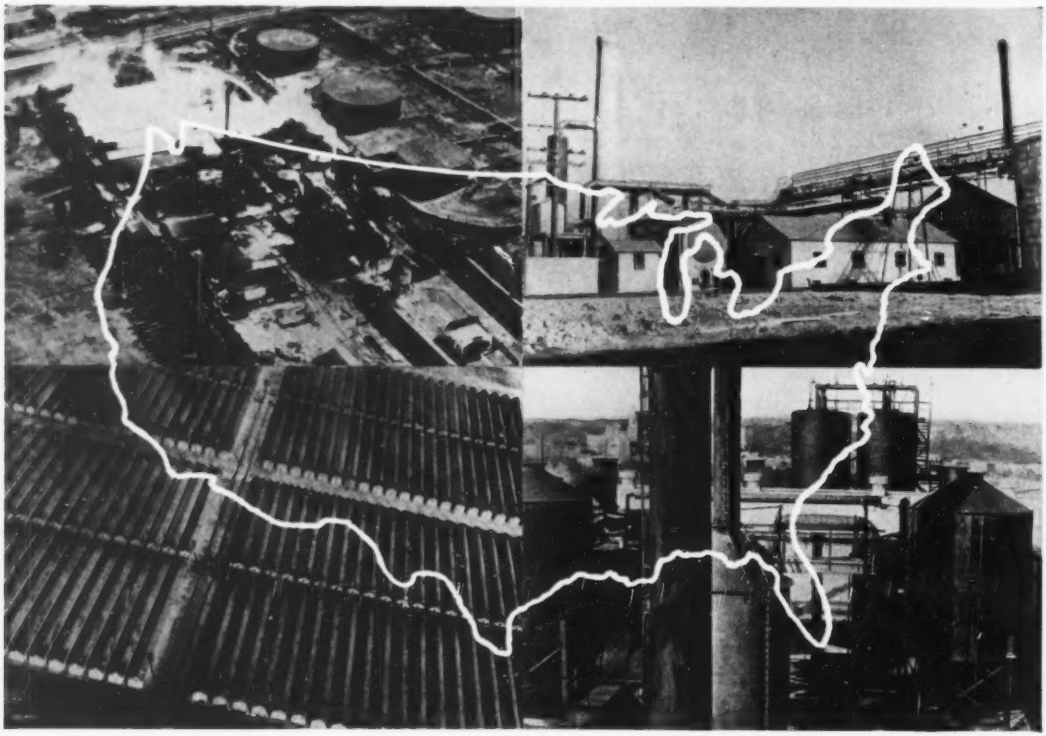

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Pirate's Alley—Pictures by courtesy of the Kansas City Southern Railway.

*The* INSTITUTE SPOKESMAN

*Published monthly by*

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## ABOUT THE COVER . . .

### STRATCO HIGH DISPERSION CONTACTOR

On the front cover of this month's "Spokesman" is illustrated a Stratco High Dispersion Contactor. The design shown is that which is being currently employed in grease manufacturing operations for pressure saponification of various types of soaps (soda base, calcium base, mixed base and other types of soaps), manufacture of cutting oils, sulfurization of oils, finishing steps in the manufacture of soda base and mixed base greases and for finishing steps in many types of fluid greases. The unit is also employed under vacuum for deaeration of finished products.

The contactor is equipped with heating surface for rapid heating of contents using the Stratco Hot Oil Circulating System or other heating medium moving at relatively high velocity through the jacket and through the internally heated circulation tube. The velocity of the mixture passing over these heating surfaces is sufficiently high to guarantee the manufacture of soaps in a very short time cycle, this time cycle being less than 15 minutes in many cases.

The Stratco Contactor is a device which is built in volumetric capacities ranging from 300 cc. to 6200 gallons. Its operation is predicated upon extremely high internal circulation rates. In continuous operations the circulation rate is many times the throughput rate and in batch operations the contents are turned over an extremely large number of times, before the batch is withdrawn. Mixing is accomplished by many changes in velocity and direction as well as extreme turbulence provided by a special type of impeller used in conjunction with straightening vanes. The flow through the unit is linear, not spinning, and is therefore not subject to the centrifugal force of a spinning mass with its resultant disadvantages to mixing.

The contactor is adaptable to all types of mixing problems where one or more of the materials to be mixed is a liquid. It can be used for mixing liquids with liquids, liquids with vapors and liquids with solids. It can be constructed with either jacket or tubular heat exchanger surface for either heating or cooling and is a great advantage where it is necessary to absorb exothermic heat in chemical reactions.

The contactor can be designed to fulfill the requirements of many very complex mixing problems.

## Institute Spokesman Gets Plastic Surgery

We've had our face lifted! Like a vain old woman we've had the distracting wrinkles taken out. We want our front to keep stride with the new improved layout on the inside of the "Spokesman." Since our thought is modern in keeping up with the lubricating grease industry, it necessitates a modern looking cover. And so, we keep working to give you better reading and a more attractive magazine.

# President's page

*by* B. G. Symon, President N.L.G.I.

One of the important trends in the grease industry is the growing tendency to make both technical and market research indispensable adjuncts of marketing thinking. As a result, there has been a gradual substitution of scientific planning for hunches and off-hand predictions in mapping sales programs. The trend is indicative of progress, and cannot fail to work to the best interests of the industry and its customers.

I think it will be worthwhile to consider briefly both types of research—technical and market—and see how each gives purpose and drive to a company's sales planning.

Technical research includes basic research, test research, product development and product application.

The first of these, **basic research**, makes a company's sales staff confident that product developments and improvements are supported by sound knowledge of the fundamentals.

**Test research** often provides the salesman with valuable talking points about the merits of products and their evaluation.

**Product development** is naturally the phase of research closest to the marketing man because it supplies him with products necessary to round out his sales program and keep it competitive.

**Product application** research gives the salesman information about the merits and limitations of a product and enables him to make correct recommendations regarding its use.

Divided as it is into these four separate and rather elaborate phases, technical research is admittedly expensive, but it has become indispensable to the modern grease marketer. Every phase of it builds increased pride and confidence in the company's products among the sales staff. This confidence is passed along to the customers, resulting in added prestige for the company.

The opposite number of technical research, which supports marketing activities from the scientific side, is marketing research, which is integrated with laboratory developments in order to make the over-all research program still more valuable to the marketing department.

Market research usually has a three-fold purpose. It is used, first, to study expansion in markets in order to promote sales of current products; second, to plan new products for existing markets; and third, to develop new markets for new products.

Well coordinated technical and market research programs provide marketing departments with a complete line of products adjusted to the requirements of modern industry and they furnish background knowledge which permits not only well-planned marketing programs, but also increased marketing efficiency and improved revenue.

# The Phase Study Approach to Grease Problems*

By Marjorie J. Vold and Robert D. Vold
Contribution from the Department of Chemistry,
University of Southern California

**Summary**

The solubility relations of metal soaps in hydrocarbons can be represented on a conventional phase diagram. Available information about sodium, calcium, and lithium soaps in various hydrocarbons and the polymorphic behavior of a considerable number of solvent-free soaps suggests that the phase diagrams for many soap-oil systems will be quite similar to each other in general features but very different as regards the compositions or temperatures of occurrence of individual phase changes.

The properties of a given grease, particularly its behavior on heating, may depend quite critically upon its phase behavior although many properties will depend also upon the colloidal structure. Different colloidal structures may be realized with the same phases present. It seems likely however, that the particular structure obtained may in some cases depend on the phase state of the system during processing.

Ever since the early work of McBain laid the foundation for a phase interpretation of soap-boiling practice, it has become increasingly evident that the same approach could be useful in rationalizing the behavior of soap-oil systems. McBain himself, and also Lawrence[4] and G. H. Smith[7] have been instrumental in gaining recognition for this point of view. It is the purpose of the present paper to review the available information about the phase behavior of soaps in oils from the standpoint of its applicability to grease problems.

Two points must be kept clearly in mind in this approach. First is the fact that a conventional phase diagram refers to equilibrium conditions, which may or may not be realized under given conditions of manufacture, storage or use of lubricating greases. Buerger, L. B. Smith, Ryer and Spike[1] have introduced the concept of a "phase map", representing the phase state of a system of given composition as a function of the temperature at which it has been subjected to intense mechanical working, followed by quick cooling. Vold[12] has shown that this idea is useful in interpreting the behavior of calcium stearate in cetane.

Second, the properties of a grease may depend quite as much upon its colloidal structure—size, shape, manner of aggregation and perfection of soap crystallites or fibers—as upon the actual phases present. However, the colloidal state and phase state are not independent. It is desirable to investigate to what extent the colloidal micelles in a fluid or liquid crystalline soap-oil system at elevated temperatures serve as nuclei for the production of diverse sorts of fibrous structures when the system is cooled.

* This paper was prepared as part of a project "Phase Studies of Greases" supported by the Office of Naval Research, Contract No. N6onr-228-TO-2, NRO57057.

**Experimental Methods for Phase Studies of Grease**

The experimental objective in phase studies of greases is to establish the number, composition and state of aggregation (crystalline, liquid, liquid crystalline, etc.) of the phases present in a given sample as a function of its total composition, past history, and present temperature (and perhaps also pressure). The methods available can be conveniently classified as "static", dependent on direct observations or measurements on the sample at the specified composition and temperature, or "dynamic", dependent on deduction of the previous state from changes seen or otherwise detected when conditions are altered.

Visual and microscopic observations, including use of the electron microscope (3.9), have yielded valuable information. In this connection, observations of the appearance of soap-oil systems at low magnification between crossed polaroids or Nicol prisms is more revealing than has been generally recognized. For example, anhydrous calcium stearate swells and dissolves in oils at a temperature of about 120°C. At higher temperatures, say 175°C., all samples from 0-100% soap have a similar appearance viewed in ordinary unpolarized light. They are transparent, or nearly so, and the only apparent difference between them is in fluidity, which decreases sharply at about 10-20% soap. However, viewed between crossed polaroids, the following results can be obtained:

| COMPOSITION LIMITS | APPEARANCE | INTERPRETATION |
|---|---|---|
| 80-100% soap | Bright fibrous specks against a seemingly isotropic background | One phase. This form of the soap can dissolve up to 20% cetane at 175° |
| 75-80% soap | Mixture of above with uniformly brilliantly anisotropic liquid crystal | Two phase region |
| 70-75% soap | Uniformly anisotropic | One phase region. Liquid crystalline solution of soap and cetane |
| 55-70% soap | Mixture of seemingly isotropic solution of soap in cetane with above anisotropic material | Two phase region |
| 25-55% soap | Seemingly isotropic but some bright specks increasing in amount with increasing soap content; rigid | doubtful |
| 5-25% soap | same as 25-55% but much more fluid | doubtful |

Extension of this type of observation to higher and lower temperatures is useful in establishing the position of phase boundaries.

X-ray diffraction studies of soap-oil systems have so far been limited to room temperature. The patterns obtained exhibit reproducible differences from each other, depending on thermal pre-treatment of the sample and on its composition. A very substantial amount of theoretical development is necessary before effects due to particle size, lattice deformations, etc., can be definitively distinguished from changes in pattern resulting from phase changes.

Observations and measurements made on heating or cooling suffer from the difficulty that very slow rates of temperature change must be employed if equilibrium is to be achieved at each temperature. Undercooling with respect to the separation of crystalline phases is very common, so that observations during heating are to be preferred. Differential thermal analysis carried on at a rate of 0.5 deg./min. is satisfactory but 1.5 deg./min. is probably too fast. Cooling curves, though not useful in establishing equilibrium phase diagrams, may prove very informative about the possibility of realizing metastable phase states at room temperature.

### The Phase Behavior of Anhydrous Soaps in Hydrocarbons

*General*: In so far as the available data warrant generalization, it appears that few if any normal soaps are appreciably soluble in hydrocarbons at room temperature. The solubility appears to increase rapidly over a narrow temperature range, dependent to some extent on the particular hydrocarbon, and generally somewhat lower (2-30°) than the temperature at which the solvent-free soap transforms into a mesomorphic state. At the same time the soap in equilibrium with the solution swells and may be transformed to a liquid crystalline phase.

The various polymorphic forms of the alkali and heavy metal soaps all appear to reflect a stepwise disintegration of the soap crystal lattice in contrast with the sharp single melting temperature of crystals of more isometric molecules[11]. The solvent power of the intermediate forms for foreign molecules can be expected to vary greatly with the soap structure and the nature of the solute. For example, waxy lithium stearate can dissolve 40% cetane but only 10% decalin (see Fig. 2).

Most soaps appear to be completely miscible with hydrocarbon above their melting points, though the true melting points are often so high that chemical decomposition invalidates the observations. It should be noted, however, that one or more liquid, crystalline phases often persist to temperatures markedly higher than the melting point of the oil-free soap (as in Fig. 1 for sodium stearate in toluene; Fig. 2 for lithium stearate in decalin).

*Sodium Soaps.* Smith and McBain[8] have studied the phase behavior of sodium stearate in a number of light hydrocarbons; Leggett, Vold and McBain[5] studied the solubility of sodium palmitate in a variety of liquids including n-heptane, Nujol and cetane; Doscher and Vold[2] have presented a substantially complete diagram for sodium stearate in cetane. Fig. 1 gives the phase behavior of sodium stearate in toluene and in cetane.

The two systems are representative of both the similarities and the differences to be expected of a soap in different hydrocarbon solvents. Increase in soap concentration in the isotropic hydrocarbon solution, accompanied by formation of a liquid crystalline soap solu-

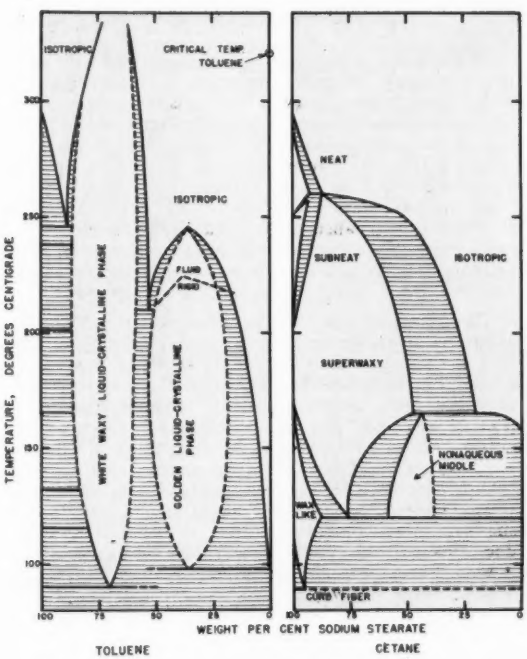


Fig. 1 Phase Diagrams for Anhydrous Sodium Stearate in Toluene and in Cetane. Toluene from Smith and McBain (8), cetane from Doscher and Vold (2), both redrawn to the same scale. Smith and McBain state that the solubility of toluene in the various polymorphic forms of sodium stearate is known to occur but is not represented on the diagram.

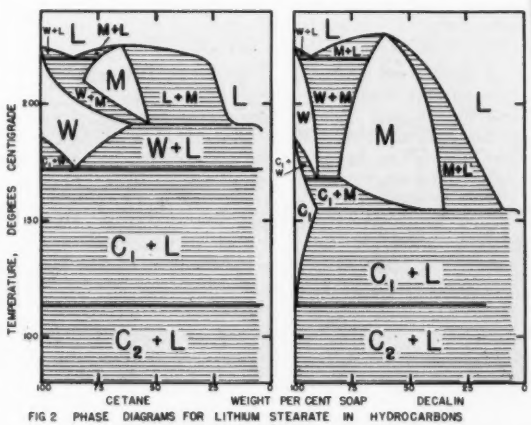


FIG 2 PHASE DIAGRAMS FOR LITHIUM STEARATE IN HYDROCARBONS

L = ISOTROPIC LIQUID SOLUTION
W = WAX-LIKE MESOMORPHIC PHASE
M = TRANSPARENT ANISOTROPIC VISCOUS LIQUID CRYSTALLINE SOLUTION
$C_1$, $C_2$ = CRYSTALLINE LITHIUM STEARATE

tion occurs at nearly the same temperature (ca 100°C). However, toluene is much less soluble than is cetane in the various polymorphic forms of the solvent-free soap. Toluene and sodium stearate dissolve in each other to produce a liquid crystalline solution phase not continuous with any form of the solvent-free soap in about the same region of composition and temperature occupied in the cetane system by the solution of cetane in superwaxy sodium stearate.

Observations on a few commercial sodium greases indicate that their behavior is more like that of sodium stearate in cetane than like that of sodium stearate in toluene.

*Calcium Soaps*: The circumstance that anhydrous calcium soaps do not form stable greases in oil in the absence of water or other additives does not detract from the utility of phase studies of the dry system in as much as in grease manufacture the soap is dispersed in oil under relatively dry conditions and the stabilizing water introduced during cooling. No complete phase diagram for a calcium soap in oil has been published. However, studies of the systems calcium stearate-cetane and calcium stearate-decalin in this laboratory have progressed sufficiently to warrant description.

Although Smith and McBain found a very high degree of similarity—virtual identity—for the solubility of sodium stearate in light hydrocarbons the difference between decalin and cetane as solvents for calcium stearate is quite marked.

In cetane, the solubility of the soap, which is very small at lower temperatures, increases enormously over a very narrow temperature interval at 120°C. At this temperature nearly 60% soap can be dispersed to form a transparent, viscous fluid. Although considerable indirect evidence has been accumulated to indicate that the solution is liquid crystalline between 22 and 57% soap, isotropic up to 17.5% soap and two phase from 17.5 to 22%, no separation into visible layers can be detected.

In decalin the temperature of rapid increase in solubility is lower, 110°C, and the isotropic solution can contain up to 38% soap. It is in equilibrium with an optically anisotropic liquid crystalline phase, which contains only 43% soap at 110°, but can contain from 35-100% soap at higher temperatures.

The relative solubility of cetane and decalin in calcium stearate varies with the phase of the soap. Crystalline calcium stearate does not dissolve much of either hydrocarbon. The form stable between 123°C and 150°C can dissolve more cetane than decalin; that stable between 150° and 195°C can dissolve about 20-25% of either liquid; that stable above 195°C can dissolve more decalin than cetane. Incorporation of hydrocarbon lowers the temperatures at which the various phases can form; the extent of the lowering is greater for decalin than for cetane.

*Lithium Soaps*. Tentative phase diagrams for the systems lithium stearate-cetane and lithium stearate-decalin are given in Fig. 2. A complete account of their determination will be published elsewhere. The solubility of lithium stearate crystals (either the form stable below 114° or above 114°) in either cetane or decalin is very low. The sharp increase in solubility which occurs near 155° in decalin and near 192° in cetane is also accompanied by increased solubility of hydrocarbon in soap and disintegration of the soap lattice to form a translucent, anisotropic liquid crystalline phase. The one mesomorphic form of the solvent-free soap can incorporate rather more cetane than decalin as might be expected from the geometry of the two molecules.

The two diagrams differ most conspicuously in the fact that different two-phase equilibria are realized as a mixture of crystalline soap with about 70-90% hydrocarbon is heated above room temperature. In the decalin system the crystals are transformed at once to a liquid crystalline phase containing only 36% soap (at 155°) whereas in the cetane system the crystals transform first to a phase continuous with the waxy form of the solvent-free soap (at 172°) and are not transformed to the more dilute liquid crystalline phase until a temperature of 190° is reached. This difference leads to considerable differences in physical appearance and texture of the two systems after heating to elevated temperatures followed by undisturbed cooling.

### The Effect of Additives

When an "additive" is incorporated in a grease, it is essential to recognize that the system is then one of three components rather than two and may have a phase behavior entirely different from that of the soap-oil system alone. On the other hand the additive, particularly when it is used in small amounts, may serve only to alter the temperatures and compositions where the same phase changes occur as in the oil-soap system itself, or may affect only the colloidal structure of the phase.

The effect of incorporating metal acetates with soaps is an example of gross alteration in phase behavior. Differential heating curves for a dispersion of normal barium soap in oil exhibit a pronounced heat absorption at the same temperature as does the oil-free soap, showing that the phase state of the grease at room temperature is a mixture of soap crystallites with oil. After barium acetate is incorporated, the temperature of the first heat absorption is raised by nearly 50°C, and visual observation shows that it is accompanied by the formation of a brilliantly anisotropic liquid crystalline phase not found in the acetate-free system.

The effect of additives such as water, fatty acids, alcohols, glycerine and glycol type solvents, phenols, etc., in small quantities appears to be an example of the opposite extreme wherein the actual phase state is probably not much affected but the colloidal structure is greatly modified. In this laboratory R. J. Coswell observed that of a number of additives, those which gave a relatively fluid, apparently isotropic solution with calcium stearate in cetane at 155°C yielded stable greases on quenching while those giving solutions of similar appearance but very high viscosity at 155° (as does the soap-oil system alone) yielded unstable gels. It would seem that the same soap-additive interaction which results in lower viscosity of the solution at 155° (smaller micelles?) leads also to a more oil-retentive fiber structure on cooling. Smith[7] expresses the view that the role of these additives is to "lessen the extreme insolubility of the soap and combine with it facilitating crystallization". How crystallization is fa-

cilitated is not clear; however the effect is a pronounced one. For example, it has been found in this laboratory that samples of calcium stearate in cetane quenched from 155°C have an x-ray diffraction pattern showing a broad halo centering around a Bragg spacing of 4.2 A° while samples containing additional stearic acid, given the same thermal pre-treatment, have a sharp line pattern due to well crystallized calcium stearate.

Available data do not appear to contain a clear example in which the effect of an additive is to modify the texture of a grease at room temperature by altering the phase state of the system from which the ultimate crystalline fibers are formed. However, the possibility of discovering and exploiting such effects is one of the practical justifications of phase studies of greases.

### Relations Between Phase Behavior and Grease Properties

Giving as it does the phase state of a soap-hydrocarbon system as a function of composition and temperature, the phase diagram for a particular grease is most directly useful in predicting and explaining the behavior of the grease on heating, provided the heating rate is slow enough to maintain phase equilibrium at each temperature.

For example, the behavior of greases as they liquefy can be readily interpreted. For this purpose it is convenient to refer to Fig. 2. A grease of lithium stearate in cetane or decalin would be said to be melted only when it had been heated to a temperature above the top-most phase boundary shown. For 15% soap in decalin this occurs at 167°. However, the soap crystallites begin to soften and dissolve decalin, and form a fluid system at 155°. The resultant grease will "drop" at any temperature in this range under appropriate experimental conditions. For 15% soap in cetane, liquefaction occurs very sharply at about 190° so that the "dropping point" of this grease would be more nearly independent of experimental conditions (except oxidative decomposition).

The phase diagram for sodium stearate in cetane shows why the "dropping point" of sodium greases is raised so markedly by increasing the soap content to 30-40%. Likewise the presence of substantial amounts of free soap solution in the grease systems of this composition above 165° indicates that the exact dropping point may depend very much on experimental conditions.

Thus the phase diagrams seem capable of accounting for the difficulties encountered in designing a reproducible measure of "dropping point"[10]. It is well known, however, that a grease may cease to function at temperatures far below its A.S.T.M. dropping point. Phase diagrams may also be useful in explaining this behavior.

For example, Fig. 2 shows that even though a 15% grease of lithium stearate in cetane does not melt below 190°, the soap crystallites undergo a transition at 114° (91° for commercial lithium stearate in oil), and swell and dissolve some cetane and transform to a wax-like state at 172°. Quick cooling from above 172° reforms the soap crystallites but in such a size or state of aggregation that the system is an elastic gel rather than a true grease. This observation is applicable to the problem of the "reversibility" of greases on heating. Two commercial lithium greases were heated to 145°; one gelled on cooling and the other did not. The one which gelled was found by differential thermal analysis to undergo a transition at 129°C comparable to that for lithium stearate in cetane at 172°. The grease which was reversible toward heating to 145°, was gelled after further heating to 175°, five degrees above the point where it showed this same transition by differential thermal analysis.

Anomalous viscosity-temperature curves such as those reported by Rochner and Robinson[6] for aluminum greases in the range 130-210°F. or by Zimmer[10] for certain types of anhydrous calcium grease undoubtedly have a phase interpretation, along the lines of increased solubility of soap in oil accompanied by dispersion of the "dissolved" soap in progressively less ordered micellar structures.

One practical use to which phase diagrams of soap-oil systems can be put is to reduce the number of trial and error preparations made in establishing the best

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processing conditions for a given composition by concentrating variations in cooling rate, etc., around temperatures where phase transitions are known to occur.

Phase diagrams can also be used for patent purposes as a means of characterizing a particular grease or type of grease formulation.


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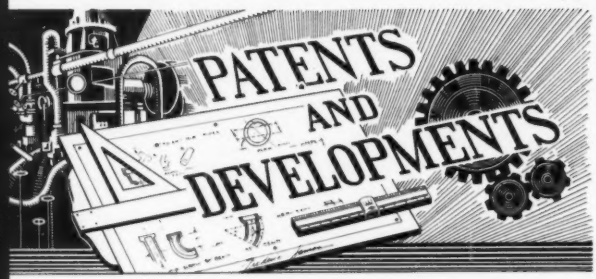


LITHIUM STEARATE IN INSOLUBLE HIGH MELTING POINT GREASES—Lithium stearate greases are insoluble in water (even at 100°), have a high melting point (192°), are elastic and stable, and lubricate at −30° to 200°. The base oil is usually naphthenic and grease stability increases with the proportion of stearate (max. 14%). The stearate must be pure, and K, Na, Cl and $SO_4$ ions have an injurious effect on consistency and stability. The grease is prepared in two steps: (1) preparation of a concentrate of stearate in mineral oil at 205-15°, and (2) slight cooling and addition of the remainder of the mineral oil. Oxidation is prevented by addition of 0.5% of p-phenyl-a-naphthylamine (Rapetti, Riv. ital. petrol. 15, No. 176, 14-6, (1947); C. A. 43, 3999).

OXIDIZED PARAFFIN IN CALCIUM SOAP GREASES—Satisfactory cup greases were prepared from oxidized white paraffin, m.pt. 51°, at 130°, in presence of manganese naphthenate catalyst. The oxidation should be stopped when 45-50% of the paraffin is converted to solid carboxylic acids. Yields were 2-2.5 tons grease per ton of raw paraffin, the grease being mechanically and chemically stable (Tsyskovskii, Azer. Neft. Khoz. 26, No. 8. 17-21 (1947); C. A. 43, 4000).

BENTONES, NEW GELLING LIQUIDS—National Lead Co., discloses that the Bentones which it produces are made by reacting bentonite with organic ammonium salts. Bentone 8 is an alkyl ammonium derivative which can be incorporated in oil as a thickening agent and aids suspensions. The materials solvate in a wide variety of organic liquid systems, imparting viscosity or consistency and thixotropy (Chem. & Engrg. News, 5-30-49, p. 1595).

WIRE DRAWING LUBRICANT—A wire drawing lubricant covered by Alox Corp., consists essentially of organic compounds characterized by containing the radicals of highly oxygenated saturated aliphatic carboxylic acids derived from a petroleum hydrocarbon mixture by liquid phase controlled partial oxidation, the carboxylic acids having an average oxygen content at least as great as that of the hydroxy carboxylic acid form of the salts. The acids are present in the form of dry soaps, particularly in association with lime hydrate. (Can. Pat. 456,512).

VIBRATING WHEEL BEARING TESTER—Since road vibration has proved to be an important factor in retention of grease on automotive wheel bearings, The Texas Co., has provided its Beacon Laboratories with a vibrating wheel bearing tester, consisting essentially of a rear axle hub assembly from a 1½-ton truck provided with vibrating means (Petr. Proc. 6/49, p. 697).

NEW GASOLINE PUMP LUBRICANT—Battenfeld Grease & Oil Corp. has begun advertising its new gasoline pump lubricant which is insoluble in gasoline and other petroleum derivatives (Nat. Petr. News 5/25/49, p. 44).

AIR-OPERATED GREASE PUMP—The Powerflo pump is an air-operated, heavy duty pump for pumping fluids and semi-fluids from original 5-gal. containers. It is supplied by Gray Co., Inc. (Iron Age 6/2/49, p. 85).

STABILITY TESTED BEARING GREASE—A stability-tested grease for general purpose bearing lubrication was announced by Norma-Hoffman Bearings Corp. Its outstanding advantages claimed are high resistance to oxidation, insolubility in water, and protection against corrosion (Gen. Elect. Rev. 6/49, p. 42).

HIGH TEMPERATURE MOTOR LUBRICATION—The Navy has been spearheading a test and development program on bearings and lubricants for high temperature motor operation, pointing to service at 150°C for 4000 hrs. So far, silicone greases offer the best prospect (Javitz, Elect. Mfg. 6/49, p. 110).

ABC's OF LUBRICATING GREASES—An article written by Miller of Battenfeld Grease & Oil Corp., is being published. (Oil & Gas Journal. 6/2/49. p. 58).

EFFECT OF WATER ON FIBER STRUCTURE—Electron micrographs of hydrated calcium soap greases indicate that the fiber or crystalline structure in the grease disintegrates on dehydration, with accompanying separation of soap and oil. Stearic acid and calcium acetate act as fiber builders in calcium greases but the fiber structure differs from that in hydrated greases. Minimum concentration of calcium acetate or water for a stable product is about 1 mol. of stabilizer per mol. of soap (Birdsall et al, J. Phys. & Coll. Chem. 52, 1415 (1948); Chem. Abstr. 43, 4455).

SOAP-IN-OIL SYSTEMS—The setting-point temperature of gels of pure metal salts in oils tends to be high for calcium, barium and strontium soaps, moderate for magnesium and aluminum soaps, and low for copper and cobalt soaps. The setting point may or may not represent a phase change. A true phase change does occur in these systems, from a paste or suspension of soap microcrystals in oil to a plastic homogeneous soap-in-oil system. Soaps dispersed in oil are readily peptized by the addition of water, glycol, cresol, fatty acid, or other polar substances. Mutual peptization of soaps containing the same fatty acid but different cations is quite general. Benefit of these observations can be obtained in commercial grease manufacture (Lawrence, Chem. Abstr. 43, 4455).

ANTISEIZE GREASE—Parker Appliance Co., obtained a patent on an anti-seize grease for sealing metal joints exposed to the action of gasoline containing 4½-6 parts of a highly polymerized blown castor oil, 1-2 parts of a zinc or calcium soap of a saturated aliphatic acid having at least 17 carbon atoms exclusive of the carboxyl group, and 0.3-1.5 parts of a neutral light mineral oil. (Can. Pat. 457,109).

LUBRICATION AND ITS EFFECT ON PAPER MILL OPERATING AND MAINTENANCE COSTS—Critchlow and Kroell of Gulf Oil Corp., presented a paper under this heading at the American Pulp and Paper Mill Superintendents Association meeting. The uses of various greases in this industry were discussed (Paper Trade Journal 6/23/49, p. 77).

MAINTENANCE OF ANTI-FRICTION BEARINGS IN THE PAPER MILL—This is the title of another paper presented at the above meeting by Spencer of The Torrington Co. Bearing failures due to various causes and proper lubrication are covered (Paper Trade Journal 6/23/49, p. 80).

GREASE COMPOUNDING PLANT—Cities Service Oil Co., is planning to build a 23,000,000 gal./yr. plant for compounding oil and grease in the Chicago area (Chem. Ind. 6/49, p. 906).

PATENT APPLICATIONS
Brit. Appl. 12,882/49 (Sandard Oil Dev. Co.)—Grease.

# Books and Publications

## . . . About the Industry

**Fuels and Lubricating Oils.**

by B. Pugh and J. M. A. Court
169 pages, illustrated, 3.50

A concise and readable book dealing in a comparatively elementary manner with the very wide subject of fuels and lubricating oils for internal combustion engines. An invaluable book for the junior members of the staffs of oil companies. Necessary information to the understanding of the elements of lubrication and engine lubricating oil specification tests are explained clearly.

**Advances in Catalysis, Volume 1**

Edited by W. G. Frankenburg, V. I. Komarewsky, E. K. Rideal; 321 pages, illustrated, $7.80.

This volume is the first of an annual series of surveys written by scientific and industrial workers. Discussions of specific materials and processes, and evaluations of new scientific theories and methods are presented in a form intelligible not only to the specialist but to the average chemist as well.

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highly specific action. Subjects as the one above should enable anybody to obtain a fairly complete concept of the practical achievements of current and new methods and of the various theoretical approaches to the manifold problems.

**Lubricants and Lubrication**

by James I. Clower, Professor and Chairman, Department of Mechanical Engineering, University of Delaware. 464 pages, 332 illustrations, $6.00.

A comprehensive practical treatment, for all concerned with the buying, selling or application of lubricants—how best to select and use them for specific purposes. The book covers all the necessary fundamentals—types, sources, and properties of lubricants, lubrication systems, fundamentals of lubrication, etc. —and includes six chapters on definite methods of selecting and using lubricants for major types of machinery important to industry.

**Fats—Oils—Detergents**

Editor: B. F. Daubert, University of Pittsburgh, Editorial Adviser: Herbert E. Longenecker, University of Pittsburgh. Issued monthly (about 800 pages per year). Subscription for current volume $36.00. Back volumes, starting 1944 at $27.00 per volume. (Binders $4.00 additional.)

This service contains the chemistry and technology of oils, fats, greases, waxes, soaps, and detergents. It culls all essential facts and figures, experimental data and results, methods of testing, description of apparatus used, and manufacturing processes from all domestic and foreign periodicals. This most extensive survey of the literature in the field has been widely acclaimed, and has proved useful to fat and oil chemists, executives, technologists in research and development, and in the plant.


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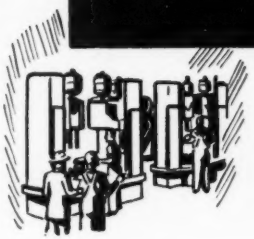

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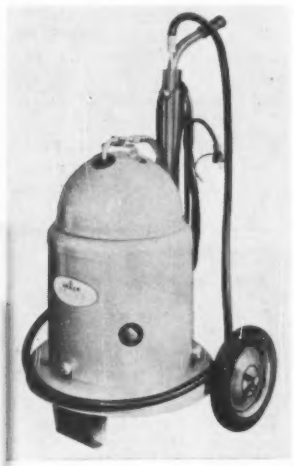

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## N. L. G. I. Greasonalities

Mr. O. H. Carlisle, division manager of the Gulf Oil Corporation in Houston, has retired and Mr. M. Farnsworth has been appointed in his place.

Mr. H. M. Fraser and Mr. T. G. Roehner have both returned from Europe. Fraser is Chairman of the Editorial Committee and Roehner is Chairman of the Technical Committee.

A Board Meeting of the National Lubricating Grease Institute was held at Hershey, Pennsylvania, June 20, 1949.

The Southwest Grease & Oil Co., has just completed the installation of a Girdler Votator grease homogenizer and deaerating unit. Plant engineers installed it at a cost in excess of $10,000.00.

Along the line of company spirit, comes the letter from Patron Oil in Canada, who vow that they have a red hot ball club. The Purity-Canucks, which is the name of the team, play in the south Saskatchewan part of the prairies where the brand of ball is a little above average.

Mr. H. C. Mounce of the Mallinckrodt Chemical Works, St. Louis, Missouri, has changed his status with that company to a semi-retired relationship. Mr. W. K. Dean has been appointed as the representative to the NLGI Technical Committee; replacing Mr. Mounce.

### OBITUARY

Edward W. Freundt, 47 years old, Manager of the Chemical Division of Armour and Company, 31st Street Auxiliaries, died suddenly July 3, 1949, in Seattle, where he was vacationing.

Mr. Freundt was employed by Armour and Company for the past 22 years, and was widely known in the chemical field. He was a member of the Paint, Varnish and Lacquer Association and had been President of the Mid-West Fats and Oils Club.

Mr. Freundt was active in the Boy Scouts of America and in church work.

Surviving are his widow, Mrs. Florence Freundt, and a daughter, Miss Lois Freundt.

### Precision Scientific Company Announces Catalog For Petroleum Testing Apparatus

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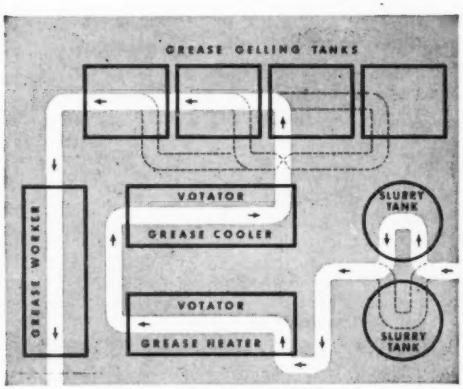


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**Chairman T. G. Roehner, Director of the Technical Service Department, Socony-Vacuum Laboratories**

Hugh Hemmingway has returned the job of preparing this column and the deadline, namely, July 11th, has "popped" up again without warning. During the writer's three months trip in Europe, Hugh guided the activities of the Technical Committee and past columns include plenty of evidence that he kept the ball rolling very satisfactorily, which is just what was expected.

It may be of interest to note that "The Institute Spokesman" is favorably received abroad. Also, the grease industry there continues to face the same problems which existed in World War II. In other words, the supply of raw materials has not generally returned to postwar status and modernization of equipment likewise has been slow.

Correspondence with Mr. H. C. Zweifel indicates that the Subcommittee on Planning is making some progress, but that this activity is not receiving the support which its importance should command. It will be recalled that the scope of this project was, in effect, the accumulation, investigation and dissemination of fundamental engineering principles and procedures pertaining specifically to the manufacture of lubricating greases. At the forthcoming October meeting, in New Orleans, a report will be presented by Mr. Zweifel covering the Subcommittee's recommendations regarding action to be taken by the Technical Committee on that project. Suggestions and comments, pro and con, would be appreciated, and they should be sent promptly to Mr. Zweifel or the writer.

Along somewhat the same lines, there has been considerable correspondence recently regarding a proposal to establish a fellowship at a university having a background of experience in fundamental research on greases. More specifically, it has been proposed to support a fellowship to study factors affecting the physical structure of greases. This proposal has not yet been assigned to a subcommittee for consideration and, therefore, it would be helpful if all members interested in that proposition would forward their comments to the writer.

Many members of the Technical Committee also actively participate in the activities of ASTM Technical Committee G on Lubricating Grease. The meeting of ASTM Technical Committee G, held in Atlantic City on June 27th, was well attended and their report will show that healthy progress is being made in the development of improved physical, chemical and functional tests. It is planned to submit a summary of the high points soon after their report has been published.

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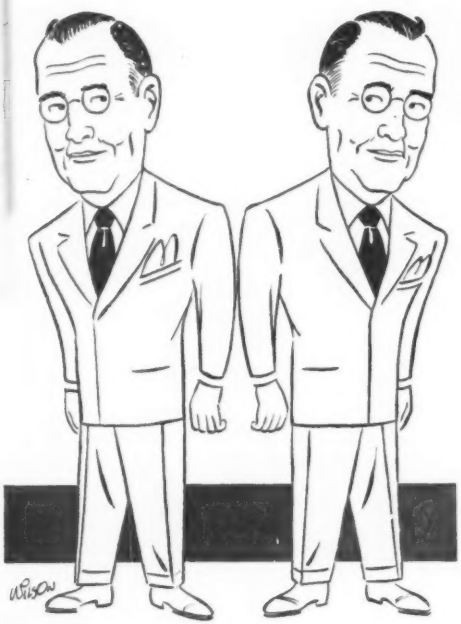

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## Extreme Jell Aluminum Stearate

Has been warmly received by grease manufacturers and proven to have the following advantages over other grades of Aluminum Stearate:

1. GIVES HIGHEST YIELD, NON-BLEEDING LUBRICANTS WITH ALL OILS.
2. SHOWS BEST ON PENETRATION TESTS, BOTH WORKED AND UNWORKED.
3. GIVES HIGHER MELTING POINT GREASES.
4. AFFORDS CONSIDERABLE SAVINGS IN COST BECAUSE LESS IS USED.
5. UNIFORM, LABORATORY CHECKED PRODUCTION.

•

*SEND FOR SAMPLE*

•

## SYNTHETIC PRODUCTS CO.

***(Established 1917)***

**1798 LONDON ROAD CLEVELAND 12, OHIO**

NOW AVAILABLE FOR PACKAGING UNDER YOUR BRAND

*Colloid Process—Lithium Base

# MULTI-PURPOSE LUBRICANT

## One Lubricating Grease for all uses

★

SATISFIED CUSTOMERS
MORE PROFITS

★

BALL AND ROLLER BEARINGS
CHASSIS
UNIVERSAL JOINTS
WATER PUMPS
WHEEL BEARINGS

## One Lubricating Grease for all year round

WATER REPELLENT
LUBRICATES SUB-ZERO TEMPERATURES
HIGH HEAT RESISTANT
GREATER STABILITY
ECONOMICAL TO USE

*Colloid Process—Jesco's Own new process—finer particles, more particles, because of increased dispersion—greater stability.

**JESCO LUBRICANTS CO.**
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*Producers of*

# LEAD NAPHTHENATE

**MOONEY CHEMICALS, INC.**
INDUSTRIAL CHEMICALS

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# 4,000 SALESMEN IN EVERY CAR...

## G.P.&F. E-Z-Fill Grease Gun Loader Container

**The container you use can be one of your best salesmen. Every car of E-Z-Fill pails contains 4,000 specialty salesmen, ready to go to work and help sell your product.**

Not only do your customers want good grease —they want it furnished in a way that makes it easy and convenient to use. Your choice of containers can add a lot to the sales appeal of your product.

When it comes to filling grease guns, the G.P.&F. E-Z-Fill Grease Gun Loader Container is a specialist. It is designed so a gun can be filled directly from the pail without removing the cover.

**IT'S ECONOMICAL** — because there is no wasted grease. Dirty grease is wasted grease — but in this pail it can't get dirty. The grease is never exposed. Dirt, grit and moisture can't get into it.

**IT'S CLEAN** — There is no messy handling involved. The grease never touches anything except the inside of the pail and the inside of the gun. The automatic shut-off disc prevents drippings before and after the gun is filled.

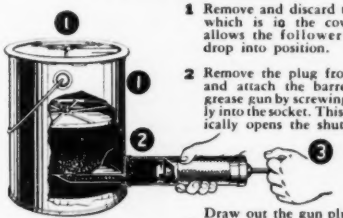
**IT'S FAST** — because it's simple to use. Three quick steps and your grease gun is filled and ready for use.

**IT'S A SALES MAKER** — because farmers, industrial plants, garages — anyone who uses grease, appreciates and wants these conveniences.

It adds an extra degree of quality to your product.

And don't overlook the possibilities of G. P. & F. lithography. A permanent advertisement can be economically added to your package.

**3 E-Z STEPS FOR FILLING GREASE GUN:**




**1** Remove and discard the screw which is in the cover. This allows the follower plate to drop into position.

**2** Remove the plug from socket and attach the barrel of the grease gun by screwing it tightly into the socket. This automatically opens the shut-off disc.

**3** Draw out the gun plunger until the gun is filled with grease. Detach the grease gun. This automatically closes the shut-off disc.

U.S. Patents No. 2,214,779, No. 2,266,827, No. 2,313,845 and No. 2,328,363. Pat'd in Canada 1942.

**FURNISHED IN 25 AND 35 POUND SIZES**

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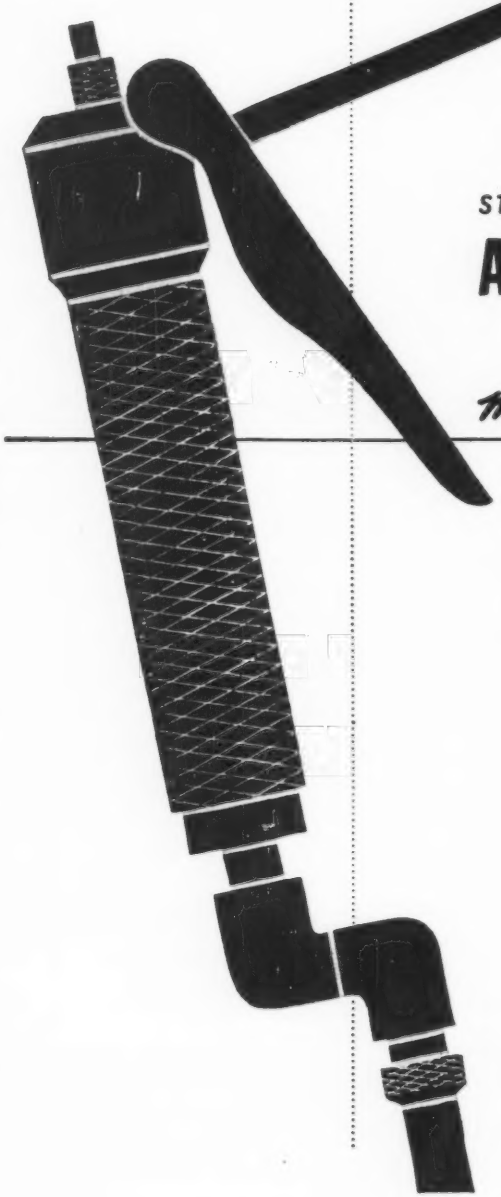

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*make good grease better*

You'll get better production and performance when you switch to Mallinckrodt Aluminum Stearates in your grease formulas. They give you:

Uniformity • Lower alkali salt content • Closely-controlled aluminum oxide and free stearic acid content • Correct degree of dryness • More grease per pound of soap.

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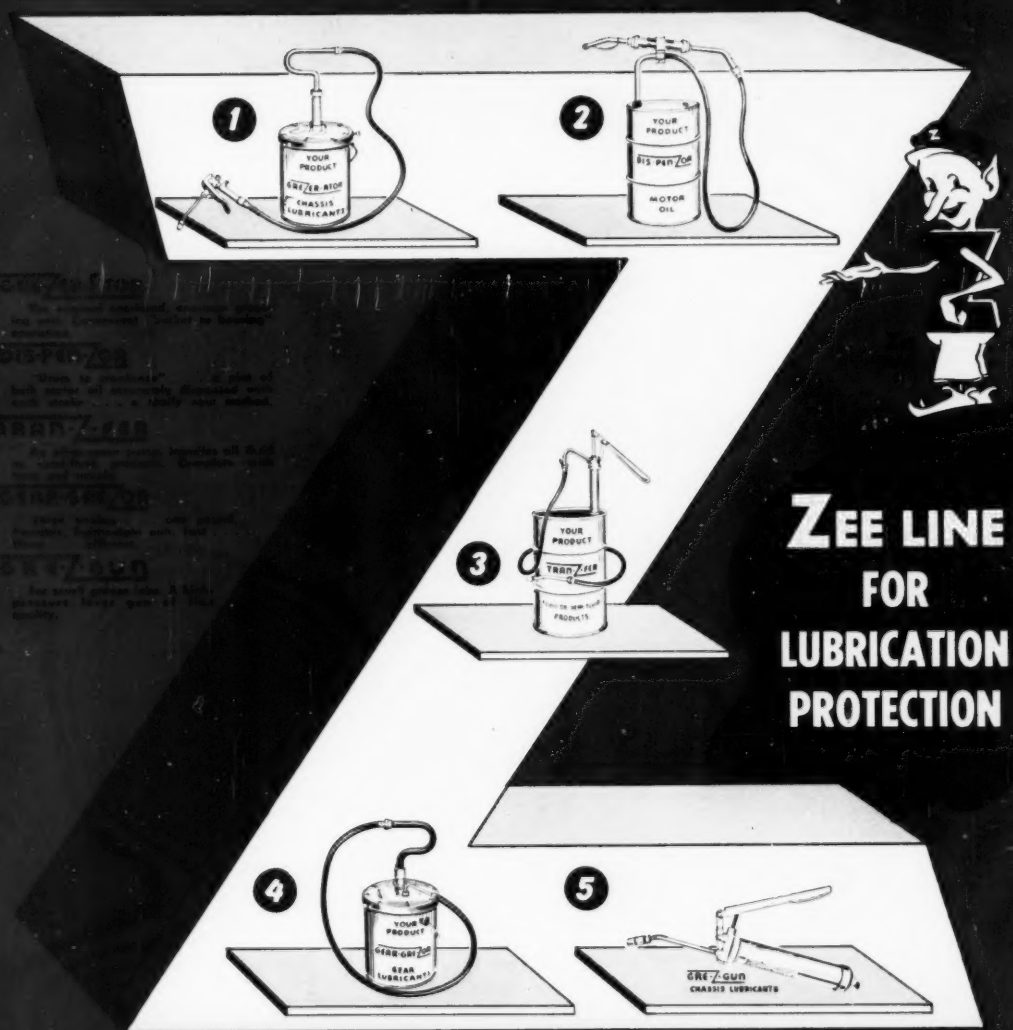
*when dispensed from the Original Container*




1 GRE-ZEE GUN

2 BIS-PAR-ZOL

3 TRAN-Z-LUB

4 GRI-GRI-ZOL

5 GRE-Z-GUN

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ZEE LINE Petroleum Lubricating Products is planned and designed to insure convenient, clean lubrication. ZEE LINE products are distributed from

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**make good oils better**

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For Premium and Heavy-Duty Service

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**The nation's leading grease manufacturers are processing with the Cornell Machine because of its exclusive micro-film method, which reduces even the heaviest greases to an extremely thin film moving over a rotating disc with great velocity and tremendous turbulence. The result is a supremely smooth, thoroughly worked product which is completely de-aerated. The processing is done at a rate up to 210 pounds per minute.**

***Write for details of installation***

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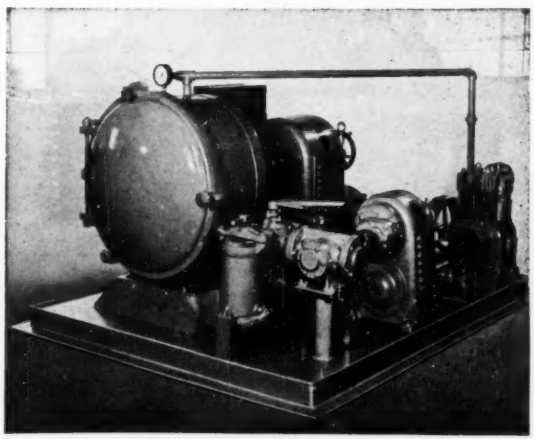

*Grease Homogenizer, showing feed pumps, strainers and vacuum pump.*

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**For Processing Lubricating Oils and Greases**

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On heavy construction jobs, when machinery is driven at full capacity hour after hour, day in and day out; operated over difficult terrain, and under adverse weather conditions—that's when lubricants must have *ability plus*, if they are to keep moving parts working efficiently and economically.

And that's where lubricants made from Metasap Stearate Bases pay off! Temperature-resistant, water-repellent, stable, they provide advantages that assure better performance under exacting field conditions. Since they do not bleed, cake, freeze, evaporate or dissolve, they do a *thorough* lubricating job *all the time*.

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